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Lagoon Manure Disposal

Purdue University Cooperative Extension Service

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AED

AGRICULTURAL ENGINEERS' DIGEST

Lagoon Manure Disposal

One method of disposing of swine, poultry, and cattle manure is by using the biological decomposition that takes place in a lagoon.

Lagoons are not always successful. They sometimes release objectionable odors, they may fill rapidly with sludge, they sometimes do not decompose the manure adequately, and they may pollute surface and underground water.

HOW A LAGOON FUNCTIONS

A lagoon is a pond of water in which 3 types of bacteria--aerobic, anaerobic, and facultative--decompose wastes. Aerobic bacteria require free oxygen, anaerobic bacteria do not require free oxygen, and facultative bacteria can grow with or without free oxygen.

Aerobic bacteria decompose waste more completely than either anaerobic or facultative bacteria. Municipal lagoons are usually aerobic. However, a livestock lagoon that uses only aerobic bacteria is generally impractical due to the large surface area that is required.

Anaerobic bacteria lagoons are the most common type used for livestock. This type of lagoon will handle more manure but will usually give off some septic odors. Unless the recommended water volume is maintained, very objectionable odors may occur, and sludge will have to be removed more frequently.

For household waste lagoons, contact your state health authorities and follow their recommendations.

Dairymen should consult with a dairy plant representative or milk sanitarian before constructing a lagoon.

LAGOON SIZE

A lagoon must be large enough to provide sufficient water in which the bacteria can decompose manure.

The waste from different kinds of livestock require different quantities of water. The minimum volume to provide for each pound of livestock is listed in the table below. The required lagoon volume equals the number given in the table, times the number of animals, times the maximum weight of each animal.

In addition, swine wastes will cause sludge accumulation in a lagoon at a rate of about 12 cu. ft. per year per animal.

WATER VOLUME OF ANAEROBIC LAGOONS

Livestock	Volume for each pound of livestock
Poultry	3 cubic feet
Swine	2 cubic feet
Cattle	1 cubic foot

EXAMPLE

A farmer wishes to build a lagoon that can handle the wastes from 100 market hogs.

Water volume required = Volume per pound x
Max. No. of animals x
Max. animal weight

40,000 cu. ft. = 2 cu. ft. x 100 hogs x 200 lbs.

A lagoon size of 60 ft. by 60 ft. and 11 ft. deep will provide the minimum water volume.

LOCATION

Locate a lagoon as far from the farm home as practical, and where the prevailing breezes will carry any odors away from the house. At the same time, your neighbors should also be considered. Court action to stop the production of objectionable odors is undesirable. To some people, odors from a lagoon may be objectionable at distances of $\frac{1}{2}$ mile and detectable at distances of 1 mile or more.

Locate a lagoon adjacent to or near the source of waste. If the lagoon is downhill from the source, gravity will carry the wastes to it.

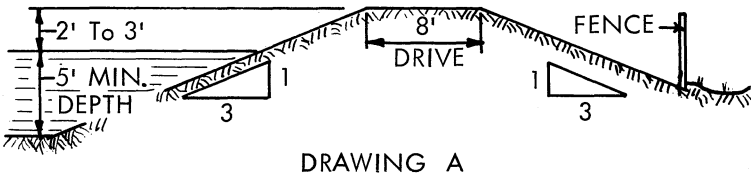
The lagoon should be located over impervious soils. Although some research results indicate that animal manures serve as a sealant, other research indicates that water and soluble materials will be lost through sandy loam soils even after several years of operation. Soil Conservation and Agricultural Extension Service personnel can help you determine the type of soil you have.

Sandy soil, and soil less than 50 ft. deep over limestone, are poor soils on which to build a lagoon. In mixed sand, silt, and clay soils, the lagoon should be constructed at least 150 ft. from a well. If the lagoon must be constructed near a locally-recharged shallow well, the bottom of the well should be higher than the top of the lagoon.

A lagoon should be nearly round or square. It should be at least 5 ft deep with the bank of the lagoon 2 to 3 ft higher than the maximum level of the water. See Drawing A.

A sodded spillway should be placed in the bank to handle excess overflow in the spring and after a heavy rain. The spillway should be about 1 ft above the desired water level and 1 to 2 ft below the top of the bank. See Drawing E.

Seed the bank with low-growing spreading grasses and keep it mowed. Install a fence to keep out animals, children, and trespassers. Post warning signs; keep gate locked.

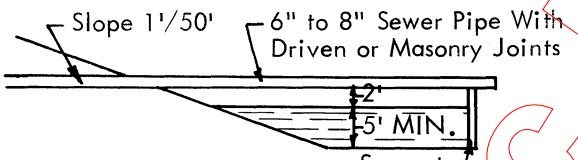


DRAWING A

INLETS

An above-the-surface inlet works well for most lagoons. See Drawing B. Liquids may freeze in the pipe in the winter and solids may clog the pipe in the summer. To help prevent this, provide a tight stopper or valve at the building, and drain gutters or collection pits at least twice a month.

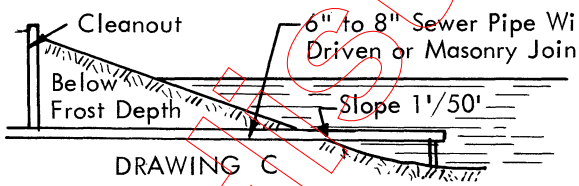
The inlet pipe should be well supported and should extend to near the center of the lagoon. Rodent entry is discouraged if the inlet is 2 ft above the waterline.



DRAWING B

A below-surface inlet requires some water pressure to work well. See Drawing C. The inlet line may plug near the water level within the pipe. This is likely to happen when wastes with a large proportion of solids are loaded infrequently.

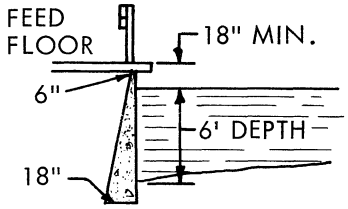
Access to the inlet line must be provided so the line may be rodded and cleaned. Locate the inlet near the center of the lagoon.



DRAWING C

Open concrete trenches may be used as an inlet. They should be about 6 inches wide. These trenches can be easily cleaned, but freezing may be a problem.

Direct loading into a lagoon is practical in mild climates.



DRAWING D

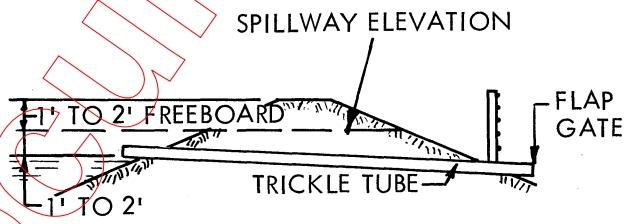
OUTLETS

When a lagoon is full, the addition of new wastes will cause some liquid to overflow. In the typical livestock lagoon, the overflow is not completely decomposed and may be a health hazard.

To avoid pollution, all overflow from an anaerobic lagoon should go into an aerobic lagoon or other waste treatment system for further decomposition. Check with State Health officials concerning overflows from aerobic lagoons and anaerobic lagoons.

It is preferable to have all overflow go into a shallow pond at spaced time intervals. This allows time for the overflow to be absorbed into soil.

A trickle tube will handle normal overflow. See Drawing E. During spring thaws, during and after a heavy rain, and when wastes are dumped on top of ice, the trickle tube may not handle the overflow. The spillway will then be used as an overflow. The spillway should also empty into the secondary waste treatment system.



DRAWING E

MANAGING A LAGOON

A new lagoon should be filled with surface or roof run-off, or with well water. Manure should be added to the lagoon gradually. It is best to start this loading in the summer months to provide the best climate for bacterial action to begin. After the lagoon is full, run-off water should be diverted away to prevent or minimize overflow.

The volume of a lagoon should be kept at the designed water quantity. See LAGOON SIZE.

A lagoon functions best if manure is added daily. This may be impractical due to the way the livestock facility is most efficiently managed. If daily loading is impractical, load as often as possible. Large, unevenly spaced loadings may cause a lagoon to malfunction.

The manure must not contain bedding. Bedding causes clogging , is slow to decompose, and will cause excessive sludge accumulation. Sludge accumulation will have to be removed when it causes the lagoon to be inefficient or to malfunction.

A lagoon may freeze solid in very cold weather. If this is likely to happen, do not use direct loading.

If an above-the-surface inlet is used, increase the height of the inlet to leave room on top of the ice for the manure that must be emptied during the winter. An alternative is to provide a separate storage for the manure until the lagoon is open.

If a below-surface inlet is used, the surface of the lagoon must be kept open or a separate storage must be provided.

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Revised May '66